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Nicholas P. Ebdici

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Quin M. Pison



US006301802B1

(12) **United States Patent**
Kato et al.(10) **Patent No.:** **US 6,301,802 B1**
(45) **Date of Patent:** **Oct. 16, 2001**(54) **VACUUM PROCESSING APPARATUS AND
OPERATING METHOD THEREFOR**(75) **Inventors:** **Shigekazu Kato, Kudamatsu; Kouji
Nishihata, Tokuyama; Tsunehiko
Tsubone, Hikari; Atsushi Itou,
Kudamatsu, all of (JP)**(73) **Assignee:** **Hitachi, Ltd., Tokyo (JP)**(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.(21) **Appl. No.:** **09/765,379**(22) **Filed:** **Jan. 22, 2001****Related U.S. Application Data**(62) Division of application No. 09/461,432, filed on Dec. 16,
1999, which is a continuation of application No. 09/177,495,
filed on Oct. 23, 1998, now Pat. No. 6,012,235, which is a
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1994, now Pat. No. 5,457,896, which is a continuation of
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No. 5,349,762, which is a continuation of application No.
07/751,952, filed on Aug. 29, 1991, now abandoned.(30) **Foreign Application Priority Data**

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(51) **Int. Cl.⁷** **F26B 5/04**(52) **U.S. Cl.** **34/406; 34/417; 34/92;
34/229; 118/729; 414/744.1; 414/744.6;
414/939; 414/940**(58) **Field of Search** **34/406, 409, 413,
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729, 730; 414/217, 225, 226, 708, 712,
715, 716, 744.6, 744.7, 744.1, 939, 940,
941**(56) **References Cited****U.S. PATENT DOCUMENTS**3,652,444 3/1972 Lester et al. .
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research and processing", J. Vac. Sci. Technol., vol. 14, No.
1, Jan./Feb. 1977, pp. 278-280.*Primary Examiner*—Pamela Wilson(74) *Attorney, Agent, or Firm*—Antonelli, Terry, Stout &
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(57)

ABSTRACT

This invention relates to a vacuum processing apparatus having vacuum processing chambers the insides of which must be dry cleaned, and to a method of operating such an apparatus. When the vacuum processing chambers are dry-cleaned, dummy substrates are transferred into the vacuum processing chamber by substrate conveyor means from dummy substrate storage means which is disposed in the air atmosphere together with storage means for storing substrates to be processed, and the inside of the vacuum processing chamber is dry-cleaned by generating a plasma. The dummy substrate is returned to the dummy substrate storage means after dry cleaning is completed. Accordingly, any specific mechanism for only the cleaning purpose is not necessary and the construction of the apparatus can be made simple. Furthermore, the dummy substrates used for dry cleaning and the substrates to be processed do not coexist, contamination of the substrates to be processed due to dust and remaining gas can be prevented and the production yield can be high.

11 Claims, 1 Drawing Sheet